

Large-Scale Structures in the Zone of Avoidance: The Galactic Anticenter Region

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ABSTRACT

A sample of galaxy candidates selected from the IRAS Point Source Catalog was observed in the 21cm line of neutral hydrogen in order to identify galaxies and measure redshifts. This generated a uniform sample of IRAS galaxies in the area of $2^h < \alpha < 10^h$ and $0^\circ < \delta < 36^\circ$, which crosses the Zone of Avoidance (7,0A), close to the Galactic anticenter, and includes most of the heavily obscured Orion-Taurus region. The galaxy distribution from this survey provides a view of the 1:11-, c-scale structure in that area unbiased by Galactic reddening. The main results are: (1) the possibility of a nearby (*i.e.*, $v \lesssim 3000 \text{ km s}^{-1}$), nearly optically hidden, rich galaxy concentration in this region can be ruled out. (2) The main part of the Pisces-Perseus supercluster is limited to $\alpha < 3^h$ in our survey region by two giant voids between 3° and 4° . (3) There are excessive galaxies at velocities around 5000 and 8500 km s^{-1} , respectively. The latter "wall" appears to gradually diffuse out after it enters the 7,0A from the northern Galactic hemisphere.

Based on our data and other galaxy surveys in or near the Galactic anticenter part of the ZOA, we have shown that the main ridge of the Pisces-Perseus supercluster does not extend to Abell 569, a cluster in the northern Galactic hemisphere, and that the simple gravitational models consisting of the Local Void (Tully & Fisher 1987) and Puppis and Fornax-Eridanus clusters would predict a "Local Velocity Anomaly" whose direction is probably too far away from that derived from observations.

Subject headings: galaxy: distribution galaxies: redshift infrared: sources
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1. Introduction

Galaxies have been identified optically in the Zone of Avoidance (ZOA) with or without using IRAS positions (*e.g.*, Böhm-Vitense 1956, Fitzgerald 1974, Weinberger 1981, Kraan-Korteweg 1989, Saito *et al.* 1990 & 91, Yamada *et al.* 1993, Takata *et al.* 1994, Weinberger *et al.* 1994, Wakamatsu 1994). While optically generated galaxy samples are quite uniform at high Galactic latitudes, they become highly nonuniform near the Galactic plane ($|b| \lesssim 5^\circ$) and in regions of excessive and patchy reddening, making it difficult and ambiguous to interpret the observed galaxy distribution in the ZOA. Blind HI 21cm surveys (*e.g.*, Heri & Henning 1987) would produce a uniform sample, but are very time consuming with current technology.

In contrast, the IRAS Point Source Catalog (Version 2, 1988; hereafter PSC) is fairly uniform above a few degrees in Galactic latitudes and away from the Galactic center. Follow-up HI 21cm observation of far-infrared (FIR) selected PSC galaxy candidates allows one to identify galaxies and therefore to generate a sample of galaxies which is free from Galactic extinction (Lu *et al.* 1990). Such a sample offers an unbiased view of the large-scale structure in and across the ZOA. The results of such an approach can easily be integrated into existing IRAS redshift surveys outside the ZOA (*e.g.*, Strauss *et al.* 1990, Fisher *et al.* 1992, Lawrence *et al.* 1994) to achieve a better sky coverage.

In this paper, we applied the above extinction-free approach to the region bounded by $9^h < \alpha < 10^h$ and $0^\circ < \delta < 36^\circ$. This region is approximately opposite to the galactic center, and is referred to as the "anticenter region" throughout this paper. The part of this region with $b < 10^\circ$, which contains most of the highly obscured Orion-Taurus region, is of interest for several reasons: (i) The region was always masked out in previous redshift surveys for its high Galactic extinction. (ii) The observed "Local Velocity Anomaly" of the Local Group is pointing towards this region (Faber & Burstein 1988), which suggests